

BETy

GASOLINE CONTAMINATION OF PRIVATE WELL WATER SUPPLY



TOWNSHIP OF REAR OF LEEDS AND LANSDOWNE
COMMUNITY OF LYNDHURST



Ontario

Ministry
of the
Environment

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COMMUNITY OF LYNDHURST

GASOLINE CONTAMINATION OF PRIVATE WELL WATER SUPPLIES

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MINISTRY OF THE ENVIRONMENT

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INTRODUCTION

At the request of Mr. G. Macey, Industrial Waste Branch, Kingston, an investigation was conducted by the Water Quantity Management Branch in the Community of Lyndhurst, to determine the cause of gasoline contamination of the Chisamore and Post Office well-water supplies, shown in Figure 1.

The study included an office examination of water-well records on file for the area and a review of pertinent literature. Field work consisted of an examination of geologic and topographic features, the collection of well-water samples for chemical analyses and interviews with local residents. Well locations and sampling locations are shown in Figure 1.

The Ministry undertook follow-up work in conjunction with representatives of the Ministry of Consumer and Commercial Relations, in an attempt to differentiate between the various contaminant sources and to locate the source of the product entering the affected wells.

BACKGROUND

In July, 1972, Mr. F. Chisamore drilled a well on his property, shown in Figure 1. During drilling, water and gasoline were found at a depth of 30 feet. The 6-inch casing was sealed with concrete to a depth of 38 feet and the well was then extended to a depth of 65 feet. Within a week of completing the well, gasoline was noticed on the surface of the well water. On June 12, 1973, Chisamore's well water was sampled and analysed by representatives of the local Health Unit with the result that a concentration of 8 ppm of gasoline was detected in the water.

Mr. Chisamore's neighbour to the west, a Mr. Wing, the owner of Wing's Sport Store and Gulf Gasoline Station, had three wells drilled before good water was obtained. The third well is 190 feet deep and is cased and sealed to a depth of 100 feet. Gasoline storage tanks at Wing's station were reported to have leaked previously, contaminating Mr. Wing's well. In the past, there have been other gasoline stations and storage tanks on or about the same property, but it could not be confirmed that all the old tanks had been removed.

A well was drilled in June, 1973, at the community's Post Office about 200 yards to the east of Chisamore's well. Water from this well was reported to have a gasoline taste and odour upon its completion.

GEOLOGY

Bedrock in the study area is Precambrian granite. To the east, Potsdam sandstone lies unconformably on the Precambrian rock. Still further east of the study area, limestone is reported in well records to overlie the sandstone. The granitic bedrock outcrops in several places within the community and forms the bed of the river flowing through the area. The rock has a regular fracture pattern with the following orientations, as determined from an examination of outcrops along the river bank.

Fracture A	Strike N10 ⁰ E	Dip 90 ⁰
Fracture B	Strike N80 ⁰ W	Dip 65 ⁰ N

Overburden locally is very thin ranging from 0 to 10 feet in thickness. It consists of a thin lacustrine sand overlying a thicker deposit of lacustrine mucky clay. Topography is uneven and closely follows bedrock contours, with a gentle dip in a westerly direction toward the river.

HYDROGEOLOGY

Almost all drilled wells in the area penetrate bedrock and obtain water from water-filled joints and fractures. The direction of groundwater flow in the bedrock aquifers could not be clearly defined because data on the waterbearing zone is limited. In general, local flow would be controlled by the topography and the orientation of fracture patterns in the bedrock. Thus flow would be expected to be in a westerly direction toward the river.

Few wells obtain water locally from the overburden because it contains a high clay content and does not release its water content readily. Drainage in the overburden is poor and generally follows topography.

WATER QUALITY

Water samples were collected from local wells on July 3, August 3 and 23, 1973, and March 4 and 11, 1974. The results of the chemical analyses are shown in Table 1 and the sampling locations are shown in Figure 1.

Gasoline was identified by these analyses as being present in two well waters in Lyndhurst. The product in the Post Office well was consistently shown to be relatively fresh while the gasoline in Chisamore's well water, in general, displayed a slight degree of aging.

Gasoline, a crude oil distillate, does not occur naturally in groundwater. Gasoline in water does not form a hazard to human health as supplies become aesthetically objectionable at concentrations far below the chronic toxicity level.¹ McKee and

1. McKee, N.E. and Wolf, H.W., "Water Quality Criteria", 2nd edition, The Resources Agency of California, State Water Quality Control Board, Sacramento, Calif., Pub. No. 3-A (1963).

Wolf also report that there is no danger of lead poisoning from gasoline in water.

SOURCES OF GASOLINE

There are three known possible sources of fresh gasoline, a Shell gasoline station, a Gulf gasoline station and a gasoline storage tank at the Township Yard, the locations of which are shown in Figure 1.

Dip readings at the Shell facility showed that from May 19 to August 11, 1973 (84 days), the regular 2,000 gallon tank was short by 17 gallons and the premium 1,000 gallon tank was over by 14 gallons. These tanks are 13 years old.

Dip readings have not been kept at the Gulf Station, but from receipts it was calculated that from July 3 to August 22, 1973 (50 days), the regular 2,000 gallon tank was over by 355 gallons. The premium 1,000 gallon tank was over by 18 gallons for the period of July 17 to August 22, 1973 (36 days). The 2,000 gallon tank is about a year old while the 1,000 gallon tank is about four years old.

A gasoline pump and underground tank are located at the Township Yard. No dip records have been kept on the tank.

There have been a number of gasoline spills and leaks in Lyndhurst, the most recently known spill having occurred about four years ago. It has been estimated that the gasoline in the affected wells is relatively fresh so that these older spills can be eliminated as being the cause of the present problem.

Instructions were given by the Ministry of Consumer and Commercial Relations to the appropriate persons to ensure that the storage facilities in question were tested in accordance with the Gasoline Handling Code. The tests were conducted with the following results, as reported by Mr. A. I. MacIver of the above Ministry:

April 1 - Township Yard, distribution lines and tanks tested, no loss of pressure noted, system appears to be sound.

April 11 - Wing's Gulf, distribution lines and tanks tested, no loss of pressure noted, system appears to be sound.

April 16 - Warrens Shell, distribution lines and tanks tested, a loss of pressure was noted in a distribution line in the regular grade gasoline service; this was the only apparent leak at this location, and it has been repaired.

ALTERNATE SOURCES OF SUPPLY

Several alternatives could be attempted to restore potable water supplies. These include:

1. The water could be filtered through activated carbon-diatomaceous earth to remove tastes and odours of gasoline. These filters work on the principle of

adsorbing low concentrations of petroleum products from the water. Once the adsorption capacity is exhausted, the filter media must be replaced. The replacement period is a function of the size of the filter, the concentration of the contaminant and the quantity of water being filtered. The filters are available from companies in the water-conditioning field.

2. The presently affected wells or alternate wells could be drilled with extended sealed casing. This alternative was successfully employed on the Wing property; however, there is no guarantee that gasoline will not migrate to lower aquifers through the fracture system in the bedrock.

3. Water could be hauled to the affected residents.

SUMMARY AND CONCLUSIONS

Two wells in Lyndhurst have been polluted with gasoline. These wells, the Chisamore and Post Office wells, are bedrock wells that obtain water from water-filled fracture systems within the granitic rock that outcrops locally. One other well, at Wing's Sports Store and Gulf Gasoline Station, has had a history of gasoline contamination. However, the problem was overcome by drilling to a depth of 190 feet and casing and sealing the well to a depth of 100 feet.

The hydrogeologic environment at Lyndhurst is one of a relatively thin, permeable lacustrine sand and clay overlying fractured granitic bedrock. The groundwater flow systems in this environment are highly susceptible to the entry of pollutants lost at or near the ground surface. The anticipated direction of groundwater movement in the area is in a westerly direction; however, in local systems, pumping of wells and rock permeability may influence contaminant movement in a counter direction to regional flow.

Through the follow-up work of the Ministry of Consumer and Commercial Relations, a leak was found in the distribution line in the regular grade gasoline service at Warrens Shell. Because of the proximity of this leak to the affected Post Office well, and the relative freshness of the contaminant in the well, it is felt that this leak is the likely source of the contaminant in the well. Because of the slight aging of the gasoline in Chisamore's well, it is apparent that product has migrated down gradient from the Shell station to the Chisamore well and with time has entered and contaminated Chisamore's well-water supply.

TABLE 1

Gasoline Concentrations (ppm) in Well Waters
Sample Data

ND=none detected

Well	July 3	August 3	August 23	March 4	March 11
Stevens			ND		
Post Office		8	13	4.5	2
Gylles Mustand			ND		
Wing's Sports		ND	ND		
Regan			ND		
L. Galloway			ND		
Campeau			ND		
Davis			ND		
H. Laperrier			ND		
Warner		ND	ND		
H. Wilson			ND		
J. P. Harvey			ND		
F. Chisamore	ND	2	1	0.1	2
O. Kenny	ND				
D. Chisamore	ND	ND	ND		
Township	ND	ND	ND	ND	

